

ATLIS Wireless LLC
Telesaurus VPC LLC
AMTS Consortium LLC
Telesaurus Holdings LLC
Skybridge Spectrum Foundation
Intelligent Transportation Wireless LLC

www.telesaurus.com

www.tetra-us.us

Advanced Transportation Location & Information Service • ATLIS •

Berkeley CA

Ex parte presentation

March 7, 2008

Marlene Dortch
FCC, Office of Secretary
445 12th Street, SW
Washington, DC 20054

Re: WT 06-49: the *LMS-M ITS Radio Service* NPRM:
TETRA Wireless Technology and equipment for LMS-M for US *ITS* wireless.¹
And DC meetings, April 2008, regarding LMS-*ITS* wireless, TETRA, Federal agencies, etc.

A central assertion made by Progeny in RM-10403 and in this NPRM is that there is no equipment for LMS-M service and that equipment companies will not make any since the current rules and ITS wireless are not viable. Progeny builds its case for “flexibility” on these assertions.

Progeny has effectively admitted that if LMS-M is needed or useful for ITS radio service as the Commission intended, and if equipment therefore is possible, then it has no case for “flexibility.”

Progeny never supported its assertions: the record is entirely clear on that. Further, the above-captioned LLCs and Foundation (here, “ATLIS and Associates”) have shown in this NPRM that these assertions are clearly false: ITS wireless is critical for the US, technology is available, and equipment, as in any new radio service, can be developed if the licensees spend the time and resources (which the record shows Progeny never attempted).

As further proof of world-class wireless technology and equipment that is especially suitable for data communications under LMS-M rules (§90.353 (b) and (c)) ATLIS and Associates present the following:

As shown on the Telesaurus website listed above, TETRA is especially suitable for mission-critical wide-area ITS wireless communications.² TETRA, an open-standard technology developed under ETSI,³ is the most well developed, advanced, and cost effective forms of wireless for private and professional mobile radio services, and is optimized for mobile data services such as the frequent

¹ In addition, the above-captioned entities repeat their position raised several times previously in this docket including in their ex parte presentation made on 2.14.08 footnote 6: the Progeny ex parte reports filed on EFCS of oral presentations are defective and violate FCC ex parte rules. This applies to the most recent Progeny filings in this docket. This taints this proceeding and is good cause for appeal of any decision granting any change sought or initiated by Progeny.

² Go to <http://web.mac.com/warrenhavens/iWeb/Site%202/ITS%20Radiocom.html>

³ The European Technical Standards Institute.

short messaging needed for LMS-M ITS wireless between vehicles and the ITS systems.⁴ In addition, in the recent generation of TETRA, TETRA Release 2, the TETRA technology has been augmented substantially, including to provide for high data rates, extension of coverage range (especially for covering highway, railway, shipping ways, and pipeline corridors and the like), and interoperation with commercial wireless: all very useful for wide-area LMS-M-based ITS wireless. Indeed, as widely reported in public TETRA presentations worldwide by members of the TETRA Association, including the leading equipment companies for private wireless (see examples on the Association's website at www.tetra-association.com) the transportation industry is the fastest growing market segment or market for TETRA and appears to be already the largest, when the transportation fleet component of government users of TETRA are included in the transportation segment along with transportation-specific operations.⁵

ATLIS Associates (entities listed on the letterhead above) began substantially researching TETRA, including with outside expert technologists, in year 2005. In year 2006, they contacted the leading TETRA equipment companies including Motorola. TETRA had not been sold, and to date is still not sold, in the US due to Motorola's assertions that it will sue, for patent infringement, entities, including ATLIS Associates, that buy and use TETRA in the US. ATLIS and Associates hired legal counsel to assist in the matter, found legal solutions, and presented them to Motorola and the other major TETRA equipment companies, the TETRA Association, and various US public agencies, including Federal agencies, as well as US markets interested in TETRA including utilities and railroads. See www.tetra-us.us, page 2. In addition, ATLIS and Associates are developing the needed technical changes and making the needed economic arrangements with leading TETRA equipment companies to obtain supplies of TETRA equipment for their LMS-M licenses and their complementary 217-222 MHz licenses held in approximately the same 80% of nation as the LMS-M licenses.⁶

A recent meeting on these matters was organized and conducted by ATLIS and Associates in Las Vegas last week, in conjunction with the 2008 IWCE wireless exposition, with 19 leaders from the TETRA community worldwide and representative of US Federal agencies and private radio market

⁴ We are not addressing here LMS-M multilateration radiolocation technology: that was previously presented in this docket by ATLIS Associates. But in brief: such equipment is also entirely feasible and is in development by Telesaurus for LMS-M ITS wireless, and similar equipment is already in increasing commercial service worldwide in the heavy-construction, major-agriculture, open-mining, maritime-ports, military (including US) and other market segments. For examples (excluding items involving Telesaurus proprietary developments) see the following links. Note: in some discussions of "pseudolites" (pseudo satellites) based on terrestrial use of GPS spectrum, "near-far" and other problems are discussed, along with pulsing and other solutions: however, the more effective form of pseudolites involves use of GPS-like signaling in terrestrial networks *that use spectrum other than GPS spectrum*, as Telesaurus plans for its LMS-M spectrum and that involve the majority of the technology discussed in below links: (i) <http://investor.trimble.com/releasedetail.cfm?ReleaseID=248107>, (ii) www.epicorp.com.au/upload/LeicaLocata.pdf, (iii) <http://www.gpsworld.com/gpsworld/author/authorDetail.jsp?id=37495>, and (iv) www.gmat.unsw.edu.au/snap/publications/rizos_2005a.pdf.

⁵ For example, see www.telesaurus.com, ITS Radiocomm page, chart 2.

⁶ As explained in earlier filings in this proceeding, the 200 MHz will provide very useful augmentation of the 900 MHz LMS-M licenses, including better, more-cost effective coverage in the more rural areas; mobile cross-band repeaters useful for certain mission-critical applications by government and critical-infrastructure users of ITS wireless; redundancy; etc. The collection of LMS-M 900 MHz and 217-222 MHz licensed spectrum held by the ATLIS Associates in the largest and most effective in the nation for wide-area ITS wireless.

segments. The pages attached below are some of pages from the “TETRA-US” website created and maintained by one of the ATLAS Associates, Skybridge Spectrum Foundation (listed at the top of page 1 above, again, www.tetra-us.us) and include the minutes of this meeting, with a list of the attendees.

As shown, this meeting and the broader TETRA-US initiative it served involve open non-proprietary communications and procedures aimed at broad public-interest objectives. The initiative is being well received, as the list of attendees and the meeting minutes reflect.

A second series of meetings on these TETRA-US topics, and on ITS wireless (including as a leading prospective user of TETRA in the US), will be held in Washington DC in mid April 2008. These meetings will include meetings with the NTIA, other Federal agencies including US DOT RITA, ITS America, and Congressional offices involved with ITS and FCC matters.

At the time of these April 2008 DC meetings, ATLAS & Associates, and others attending the meetings representing TETRA technology and equipment (including SDR based) that is especially suitable for LMS-M ITS communications, and the ITS community, will make in-person presentations to FCC staff involved with this NPRM (on dates and times to be arranged that is acceptable to said FCC staff) as well as other FCC staff involved in public safety wireless, since ITS wireless as planned by ATLAS and Affiliates will provide for preemption by public safety agencies in emergencies and other critical public safety applications and objectives.⁷

In addition, these meetings in the DC area being planned also include Tribal lands’ representatives and environmental organizations, with regard to Skybridge Spectrum Foundation’s plans to use, in its nonprofit programs, its LMS-M (and complementary 200 MHz) spectrum nationwide to provide benefits that ATLAS Associates for years have described to the FCC.⁸

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⁷ Many major benefits and uses of ITS wireless to US public safety are well known: these and others that ATLAS and Associates are pursuing were discussed in past filings in this docket by ATLAS Associates. See also the TETRA-US Las Vegas Meeting minutes, item 6, below.

⁸ Telesaurus Holdings GB LLC donated 2 MHz, by disaggregation, in all of its LMS-M licenses nationwide in year 2007 to Skybridge Spectrum Foundation, which is developing programs to use the spectrum (along with a substantial quantity of lower-200 MHz licensed spectrum that ATLAS Associates also donated to this Foundation in 2007) for free or cost-basis provision of the spectrum, and operating systems using the spectrum, for ITS networks for reduction of accidents, congestion, and pollution; for Tribal land purposes; for environmental monitoring and protection, and for other charitable, scientific, and educational purposes. Since at least year 1999, ATLAS Associates have, in dozens of FCC pleadings, and in other public presentations (such as to representatives of NTIA, DOT, USCG, DOI, DHS, DOA, PNT, APCO, FCCA, UTC, AAR, ITS America, ITS California, ITS World Congresses, SDR Forum, California and other State agencies, etc.) described their plans to pursue these nonprofit spectrum-based programs.

Respectfully,

/s/

Warren Havens
President,
ATLIS Wireless LLC,⁹
Telesaurus Holdings GB LLC,
Skybridge Spectrum Foundation,
and their affiliates listed above

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The attachment referenced above follows.

⁹ ATLIS Wireless LLC was formed in 2007 to provide operational services to the other entities listed above including Telesaurus Holdings GB LLC that holds LMS licenses nearly nationwide, and also assists Skybridge Spectrum Foundation that also holds LMS licensees nearly nationwide.

Attachment

As noted above, the following pages are from www.tetra-us.us, reformatted to fit in this document.

Site purpose & introduction

This site supports introduction and use of **TETRA radio** technology and equipment for advanced wireless in the US, on land, sea, and air, for public safety and other agencies, Intelligent Transportation Systems, emergency responders, critical infrastructure and private enterprises.

TETRA Legal Use Rights: *Current* rights of US federal and state agencies, and parties they authorize, to buy and use TETRA equipment under applicable law and US Supreme Court decision --

[Go here >>>>>](#)

These parties have rights to buy and use equipment that employ technologies under US patents-- without being subject to patent infringement actions, but to payment of fair compensation to holders of valid patents. To date, this information has been absent in the public communications of the US land mobile radio community, which has, instead, assumed that no party can buy and use TETRA equipment in the US due to patent holder(s) withholding of patent licenses deemed essential for TETRA.

TETRA Links: Information regarding TETRA, mostly by links to other sites --

[Go here >>>>>](#)

TETRA v APCO 25: Comparisons: advantages of TETRA for larger and expanding systems, in cost, etc.--

[Go here >>>>>](#)

US Government current use, testing of Tetra: For armed forces internationally, and domestic public safety --

[Go here >>>>>](#)

TETRA for Intelligent Transportation, Environment & Energy: [Go here >>>>>](#)

TETRA-US meetings, minutes,etc: [Go here >>>>>](#)



Site host & references



Skybridge Spectrum Foundation, Berkeley, California

Warren Havens, Director - warren.havens@sbcglobal.net

Jimmy Stobaugh, Manager - jstobaugh@telesaurus.com

Skybridge Spectrum Foundation engages in scientific, educational, and charitable activities based upon use of radio spectrum within the US for advanced wireless in the public interest: purposes noted above, as well as nationwide environmental protection, and support for "V2G" (restructuring of the energy grid to facilitate renewable energy, especially wind, electric production and its integration with electric drive and storage vehicles ("Vehicle to Grid"). The foundation is supported by members of the Telesaurus LLCs group, Berkeley, California: See www.telesaurus.com. The Foundation holds FCC 900 MHz LMS-M (Location and Monitoring Service- Multilateration) licenses, and 217-222 MHz licenses, nearly nationwide in the US, by charitable donations from the Telesaurus LLCs, which also hold the same class of licenses nearly nationwide. These licenses form the basis of nationwide wide-area wireless for high-accuracy, sub-meter-level, high-reliability vehicle location and data communications, and complementary mission-critical wireless, as explained in the Telesaurus-Skybridge website noted above.

References to entities herein do not indicate their affiliation with this website or its host, or agreement with its contents.



US TETRA Initiative TETRA Legal Use Rights TETRA Links TETRA vs P25 US Gov - Current TETRA

Las Vegas Meeting Notes

TETRA-US Meetings.

TETRA-US: Feb. 28, 2008 Meetings, Palazzo Hotel, Las Vegas

Post Meeting Draft Notes

3.4.08, v.1d

The below, drafted by Warren Havens, may be amended.

Attendees, and others invited, are welcome to comment on the below.

In addition, a notice of these public meeting minutes was provided by email to representatives of Motorola, Inc.

Note: All factual assertions indicated below are correct, as far as the drafter understands.

However, if any person provides sound evidence to the contrary, an erratum will be provided below.

Purpose and Agenda

There was a breakfast and lunch session, and a session in between that also involved a teleconference bridge (together, the "meeting"). The meeting involved *open, non-proprietary* discussion of TETRA technology and equipment use in the US. Attendance was by invitation. The goal of the meeting, and subsequent ones planned, is to substantially increase the options, competition, affordability, and rate of implementation in the US in advanced digital technology, equipment, and systems for PMRS (private or professional mobile radio service) market sectors, especially those most critical to US security and critical operations.

19 Attendees

Phil Kidner, CEO, **TETRA Association**. <http://www.tetra-association.com/>

Roland VanDerboom, President and owner of **Rohill**. <http://www.rohill.com>

Roger Dowling, Board Member, **TETRA Association** (Director Market Development, **Sepura**): Association link above (<http://www.seapura.com/>).

Juan Ferro, CEO, **Teltronic**. <http://www.teltronic.es/>

Dr. Georg Haubs, President & CEO, **Rohde & Schwarz**. <http://www2.rohde-schwarz.com/>

Heinz Bick, Chairman, **German Professional Mobile Radio Association** (and founder and past President, **Rohde & Schwarz**).

Peter Foulger, Projects, **Rohde & Schwarz**, Canada. Link above.

Charles Hoffman, **US NTIA**. <http://www.ntia.doc.gov/osmhome/osmhome.html>, /

<http://www.ntia.doc.gov/osmhome/pubsafe/activities.htm> , / <http://www.npstc.org/liaisonorg.jsp>

Klaus Bender, Director of Engineering, **UTC (Utilities Telecom Council, DC)**. <http://www.utc.org/about-utc/staff-directory>

Ken Davis, IT Telecommunications Engineer, **Northeast Utilities**. <http://www.nu.com/>

Milton Patzkowski and an **associate** (name misplaced, apologies), **Pacificorp**. <http://www.pacificorp.com/>

Dr. Daniel Devasirvatham, **SAIC**: www.saic.com , Chief Technologist, Interoperable Communications Technical Assistance Program, **US Department of Homeland Security**.

Warren Havens, President, and

Jimmy Stobaugh, General Manager, **Telesaurus LLCs** and **Skybridge Spectrum Foundation**. Spectrum and development for nationwide Intelligent Transportation System ("ITS") wireless. TETRA for ITS is discussed at this web page >>>>>.

By telephone:

Scott Booth, and

Jim Blocker, **Office of Emergency Communications**, **US Department of Homeland Security**.

<http://www.npstc.org/liaisonorg.jsp> / http://www.dhs.gov/xabout/structure/gc_1189774174005.shtm

Saneesh Apte, **California Center for Innovative Transportation**, **University of California, at Berkeley**. <http://www.calccit.org/>

Eitenne Fiset, Business Development Manager, **Lyrtech**, Quebec, Canada. www.lyrtech.com.

Invited

Representatives of NPSTC, FCCA, some States and others were invited but did/ could not attend. (Mr. Haller of NPSTC reported that he would have attended but for being tied up that day at IWCE responsibilities, and others including from DHS and Sonim noted likewise.)

They will be sent further information, including notices of these meeting notes on this website, in case they want to participate, or otherwise comment. Opposing views from such invited persons are welcome. Also see item 7 below.

Topics discussed and summary of discussion

- History involving why TETRA is not in US, and solutions. Among them, see p. 2 above: [click here >>>>>](#)
- Description of TETRA: The standard, product vendors, Association, products, pricing, major cases, and international volumes, TETRA "Release 2" and other potential changes; Current and potential expanded frequency bands; Trends: toward larger systems, with multiple agencies/ entities, increased data use, etc.; SDR on military (including US) and non-military radios (e.g. Finland); etc.
- Potential uses in US by government, and critical transport, energy, and other sectors.
- Comparison with P25 (phases 1 and 2), and with OpenSky, and means of interoperation.
- TETRA interoperation with GMS, especially using GSM-PoC-OMA and TETRA Release 2.
- Discussion of next steps, including April '08 meetings in DC with NTIA OSM, other Federal agencies, members of Congress, UTC, other trade associations, etc.

The meetings concentrated on topics a, c, and f. A summary of the discussion follows:

1. Mr. Havens of the Telesaurus LLCs and Skybridge Spectrum Foundation explained that attorneys from Motorola informed him and others that it would not license its US patents for TETRA and would pursue patent-infringement litigation in the case of use of TETRA in the US. Telesaurus asked ETSI in a formal request to seek Motorola compliance with ETSI's IPR Policy and procedures. ETSI attempted that but informed Mr. Havens several times in writing that it was not successful. In other ways and to other parties Motorola expressed the same, as partly included in public documents, such as from the State of NY, and in confirmed private communications. Telesaurus and affiliates have pursued the TETRA-US initiative openly from the start, and informed Motorola of its position described on page 2 above in open letters to the TETRA Association, its members, and Motorola. Motorola has not, to Mr. Havens, expressed any response to the open letters.

Mr. Havens further noted that Motorola never declared to ETSI (as of the last time he checked with the ETSI IPR database) its US patents relating to TETRA release 1 (as required in the ETSI member policies), but that Motorola *did* declare to ETSI in October 2006 its US patents relating to TETRA release 2 technologies (which were then being completed in the standards process), which was very soon after the August 2006 unanimous decision by the Federal Trade Commission in the matter of Rambus, where Rambus was found to have violated US antitrust law for lack of early disclosure of its patents in a developing technical standard, and its later unfair and anti-competitive "patent ambush." (Mr. Havens noted that he was not at liberty in the public meeting to discuss certain other related matters, but believes and has publicly stated that his view that antitrust law violations are involved.)

2. The Rhode & Schwarz representatives ("R&S") indicated a number of times that Motorola has given some manner of written consent to sale of TETRA in the US if R&S obtained an equipment purchase order. The other attendees asked R&S for a copy of the written consent and other related information. (After post-meeting communications with the Rhode & Schwarz representatives, they declined to provide any further information on this matter. Thus, there is no evidence that satisfies the criteria of the meeting: which is an open, public, legally sound and verifiable broad solution.) Further, Mr. Havens and others discussed the value of the proclamation solution noted on page 2 above: it could clearly resolve the problem for any TETRA patents and for any markets encompassed in the proclamation. Deal-by-deal permission of patent holders (Motorola and any others who have not licensed their US patents for TETRA under the ETSI IPR policy or other terms), even if they were in writing, legally sound, and made available to and accepted by purchasers and users, was generally seen as not a sound solution, and give the history of this matter, there was wide skepticism raised. In any case, the matter R&S indicated is under review.

3. This website on page 2 above presents a solution discussed substantially at the meeting. Mr. Havens noted that it does not require that a Federal agency issuing the contemplated proclamation do so for its own internal use of TETRA products, but it may do so for its purposes including to assist US market segments such as state and local government that do not use P25 (involved with non-public safety, or public safety: see below), *and critical transportation, utilities, and other industries that need advanced digital wireless*. Mr. Havens noted that on page 2 above is a downloadable legal memo summarizing the law in this regard.

4. Mr. Devasirvatham briefly explained the historical reason (not current technical ones) as to why Federal agencies adopted certain requirements to use equipment with less than 25 kHz channels was discussed. Mr. Hoffman also commented on that subject. Mr. Havens noted that the FCC does not have such a requirement regarding spectrum bands subject to "refarming" but instead has a 6.25 kHz equivalency requirement which includes 4-slot TDMA in 25 kHz channels, which TETRA would satisfy. [Also, some FCC radio services such as those in which the Telesaurus LLCs and Skybridge Foundation hold licenses are not subject to the "refarming" rules.] Also, Mr. Havens noted that rules (FCC and NTIA) are often waived for good cause, and that rules are often changed when new technologies and circumstances warrant. For example TETRA (and other) SDR implementation was discussed: this would render mostly moot the requirement that a certain market segment or spectrum band use one or another form of spectrum efficiency, since many could be accommodated in software. (See SDR topic below.)

5. *A consensus was expressed that, apart from Federal agency use, and non-Federal public safety use, there were large market segments in great need of advanced cost-effective proven digital wireless that TETRA may provide.* Their need for more spectrum, especially in lower ranges, below UHF, was also discussed. These include other governmental agencies and applications, the transportation sector, utilities and pipelines, railroads, airport operations, maritime ports, etc. Examples of major TETRA systems for these market segments and applications were discussed, including in rural areas where coverage range is important.

Also, the benefits of using spectrum in the lower 200 MHz range for such areas was discussed. Mr. Havens and Mr. Ferro discussed that Teltronic for a long time has made land mobile equipment in the lower 200 MHz ranges: it is substantially used in Spain for MPT1327 systems. It was noted that, while there is currently no TETRA equipment in lower 200 MHz, including the US band from 217-222 MHz, that it could be made and that the TETRA standard was developed to extend below that range.

6. In addition, one substantial value of TETRA to the Federal market, and to the non-Federal public safety market, was discussed, even assuming that these markets do not seek or use TETRA: *if TETRA is used in the US for markets noted in item 4 above, then TETRA will be regularly seen and compared with P25 by said Federal and public safety markets, and that should create more competition among technology and equipment vendors to those markets.* (It was commonly understood, but also discussed at the meeting, that TETRA has substantial advantages over P25 in a combination of features, performance, and price for many applications, as shown in worldwide results where both are sold, and in direct comparisons.)

Further, Mr. Havens explained that TETRA used in Intelligent Transportation System wide-area wireless networks will provide for major benefits to public safety organizations, and will directly provide certain public-safety and public-safety-agency applications. He has presented these in past filings before the FCC, and to some degree to NTIA, and will be further explaining these. See, e.g., the www.telesaurus.com page on "ITS Public Safety." In sum, advanced ITS based on ITS wide-area wireless (high accuracy location and near-constant vehicle-ITS communications) is clearly required for far more safe and efficient transportation systems, and systems that can be directed and controlled far better in emergencies.

(Not discussed in the meeting but discussed afterward at a dinner with some attendees is another compelling benefit to US Federal and

public safety entities ("Fed and PS") of widespread major TETRA systems in the US for the market segments noted in item 5 above: These TETRA systems may easily end up with larger capacity and more traffic than Fed and PS systems for a given region, but in any case could be very substantial, as they increasingly are in other nations. *These TETRA systems can be set up to allow preemption of substantial capacity in defined major emergencies by Fed and PS responders. That would provide huge additional capacity that is sorely needed and not otherwise available due to the enormous cost of building spare-emergency capacity of the same amount into Fed and PS radio systems.* The TETRA capacity set up for preemption would be put into use in emergencies by tapping caches of radio terminal equipment (portables and transportable) that would be controlled by Fed and PS entities placed in each region with a major TETRA network, and also at the National Interagency Fire Center, in Boise, and at the airport hubs of several overnight carriers (USPS, UPS, FedEx, DHL) for delivery within hours to any area of the US by regular or special flights, as needed. Also, TETRA and P25 systems and radios can interoperate. An example of how is seen in Rohill information in its website (see TETRA Links page above). SDR can also allow interoperation: once SDR is prevalent, any mission-critical SDR radio will be able to operate on TETRA or P25 or other protocol, and on various bands [an early example being the Thales Liberty radio].)

7. In addition, legal solutions involving States (as noted on page 2 above) were discussed. This includes the State of California, among others. (The States invited to send representatives to the meeting or call in, and others, will be sent a notice of these meeting minutes.)

8. Also, *SDR use in TETRA*, especially in mobile vehicle-installed radios, was discussed. Mr. Havens suggested that this has wide technical, legal, and other ramifications. Mr. Fiset from Lyrtech and others discussed how, without the limitations of size, weight, and power that small handheld radios impose, SDR would appear to provide at this time (given the progress in core SDR technology and core components, as from Texas Instruments and Xilinx; development platforms as from Lyrtech; and software as from Vanu and Etherstack) a compelling solution where multiple frequency bands, such as in both 150 to 222 MHz, and in 700 to 900 MHz, and multiple protocols, such as TETRA Release 1 and 2, or TETRA and P25, or TETRA for ITS and DSCR on 5.9 GHz, could be accommodated. Mr. Fiset from Lyrtech described Lyrtech's SDR development platform and services that could be used for TETRA and TETRA+ SDR, in bands from 200 up to 900 MHz (and others could be added). Mr. Havens mentioned that Virginia Tech was working on a cost-effective SDR radio for the US public safety market, and if they succeed, that may also provide the above-noted accommodation. Mr. Devasirvatham mentioned a Thales SDR radio at the nearby IWCE exhibits worth review.

Mr. Havens and other discussed why a number of very large new PMRS systems in the US planned or being planned will use both spectrum in lower ranges such as in *150 up to 222 MHz*, and in higher ranges from *700 to 900 MHz*, and also why they need various protocols, modulations, and functions, upgrades, etc. Mr. Havens noted that these suggest that SDR should be pursued for these markets, applications, and technologies for PMRS in the US and other nation. He noted that the complex ITS wide area wireless being planed by the Telesaurus LLCs and related Foundation, with CCIT collaboration, is a good example of networks that could benefit greatly by use of SDR, but also that most any wide area advanced PRMS network would also benefit. *If the radios operate mostly on SDR basis, issues of required standards and technology become largely moot.*

9. Means of cost-effectively phasing in TETRA on MPT1327 networks, or combing the two, was discussed by Mr. VanDerBoom and others. The Rohill website gives information and examples. The same applies to networks that support TETRA and other OTA protocols. Also, it was noted that TETRA competes to a substantial degree with MPT1327 on price, but details were not discussed. Further, TETRA use to support Scada, telemetry and other machine-to-machine wireless was discussed. There are cost effective TETRA radios in appropriate robust form factors made for these purposes, as Mr. Ferro noted prior to the formal meeting, as is otherwise clear in TETRA public records. Ken Davis of NU and others noted that this M2M fixed wireless market is of increasing importance. TETRA has various data protocols, including some especially efficient and suitable for short-message M2M, and advantages over P25 in that regard, and verses analog systems such as MPT1327.

10. Mr. Havens noted that NPSCT and other public safety representatives were invited a number of times. Attendees expressed that some in the public safety market in the US may oppose TETRA introduction into the US since it may be seen as detracting from P25 sales and focus and the like, or such introduction may call into question how, for so long, TETRA was kept out of the US. Mr. Havens noted that this was a not uncommon expression heard over the years, but it amounts to an argument that "protecting" a substantial commercial market by government agencies or operatives will produce net benefits, and that would be directly contrary to the foundation of US and modern free-market economics. Thus that he doubted that any one with any substantial position in government including public safety would publicly make that argument, and if they did, it could easily be dismissed.

11. The need for FCC approval of any TETRA products used in the US was discussed by Mr. Hoffman and others. Each US radio service defined by the FCC has technical requirements for radio equipment used in such service. Mr. Havens noted that these are routine matters and that ETSI technical requirement are typically similar to those of the FCC, and that in the past TETRA community looked into what changes would be needed for TETRA equipment made to ETSI standards to meet FCC requirements, and they were relatively minor ones. Mr. Dowling indicated that he also had that understanding.

12. ***Additional meetings were discussed and initially planned***, including meetings in Washington DC before certain Federal agencies including NTIA, with trade organizations such as UTC, and with some Congressional offices, and possibly the Federal Trade Commission and Department of Justice (Mr. Havens noted that he as not at liberty to publicly discuss certain related matters at this time). *The main goal would be to obtain a Federal proclamation as described on page 5 above in the reasonable future, upon a showing that a substantial need for TETRA exists among US market segments as noted in item 6 above (the Intelligent Transportation and Utility markets, well represented at the meeting, are current leading candidates), and further value would be provided as indicated in item 5 above.*

Respectfully submitted,
[Warren Havens](#),
Meeting Secretary

US TETRA Initiative TETRA Legal Use Rights TETRA Links TETRA vs P25
US Gov - Current TETRA Las Vegas Meeting Notes

TETRA links

(As indicated on the first page, entities referenced herein are not affiliated with the creation of this website.)

TETRA Association: <http://www.tetramou.com>

The Association website has information and links to case studies on TETRA use for military, public safety, other government agencies, transportation, utilities, and natural resource industries, and other market segments.

It also has information on TETRA Release 2: options for extended range, high speed data, and others.

This Association website lists the core system and enduser equipment vendors and other entities involved with TETRA: the below truncated list is provided to show current technology and equipment.



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Telesaurus, Skybridge, US

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TETRA in Intelligent Transportation System Wireless



**TETRA vs P25** (and related)

This provides summary comparisons from public sources.

### TETRA vs P25 - Introduction



**TETRA**

**P25**

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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>➤ Open standard by ETSI</li> <li>➤ General characteristics             <ul style="list-style-type: none"> <li>- conceived for many end-user types</li> <li>- aimed to handle high traffic loads</li> <li>- natively for trunking operation</li> <li>- support basic &amp; complex services</li> <li>- competition keeps costs low</li> </ul> </li> <li>➤ TDMA             <ul style="list-style-type: none"> <li>- 1 channel / 6.25 KHz</li> <li>- double spectral efficiency</li> </ul> </li> <li>➤ Global market through many sectors</li> </ul> | <ul style="list-style-type: none"> <li>➤ Open standard by TIA</li> <li>➤ General characteristics             <ul style="list-style-type: none"> <li>- conceived for US PSS users</li> <li>- for few users in wide areas</li> <li>- optimised for non-trunking</li> <li>- with trunking as an option</li> <li>- functionally simple for low costs</li> </ul> </li> <li>➤ FDMA             <ul style="list-style-type: none"> <li>- 1 channel/12.5 KHz</li> <li>- 6.25 KHz version "on paper"</li> </ul> </li> <li>➤ Market is basically US PSS<br/><small>[PSS = public safety systems]</small></li> </ul> |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

These slides, prepared for the TETRA Association in March '07, make comparisons based on evolving technology and equipment. It is apparent, however, that TETRA is more complete and rapidly advancing than P25. The overall major advantages are not likely to diminish over time. Adoption of TETRA in the US is likely to advance P25 by competition (a far more robust market for professional digital mobile radio), by contribution to P25 Phase II, etc. Mainly, it will directly benefit agencies, enterprises, and endusers-- for the same reasons TETRA is selected over P25 in most cases where they compete head to head: which is the entire world outside (thus far) the US and Canada. Also, the below does not include the additional advantages of TETRA considering Release 2: See: <http://www.tetramou.com/tetramou.aspx?id=1186>; see also data-rate chart below.

**TETRA vs P25 – Radio Coverage**

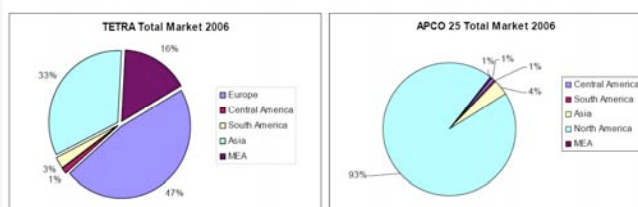
- Common perception
  - FDMA systems can provide longer range, whereas TDMA systems are more cost efficient in high capacity systems
- P25 provides longer cell radii through high power mobile radios
- Several factors drive radio planners towards smaller cell sizes
  - shared multi-agency networks increase the user density
  - trend towards the use of handsets rather than mobile radios
  - trend to deploy mobile data services extensively
- TETRA on par with FDMA technologies for terminal TX powers in the typical handset range
  - TETRA BS receiver sensitivity well beyond the standard figures
  - TETRA BS support of multi-receiver diversity

**TETRA vs P25 – Functional aspects**

- Both TETRA and P25 fulfil the basic needs of PMR users
  - voice group communications
- However, thanks to TDMA, TETRA provides also
  - full duplex individual voice calls with simple cost efficient terminals
  - reliable data link & better data throughput as full duplex allows efficient ARQ mechanisms
  - Bit rate on demand (i.e. one or more slots can be flexibly assigned for data up to 28.8 Kbit/s against 4.6 Kbit/s in P25)
- TETRA offers a higher level of security and confidentiality
  - TETRA provides E2EE and AIE (voice, data, signalling and user identities are encrypted) plus authentication to secure the access to the system
  - P25 only supports E2EE and no authentication available in real products


**TETRA vs P25 – Costs**

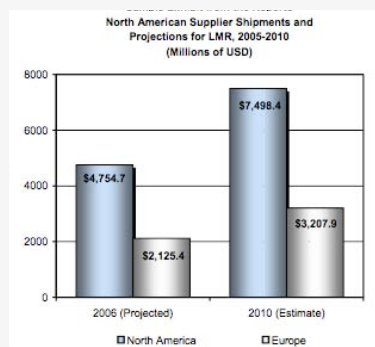
- Radio terminals
  - TETRA handsets offer all the most complex features (e.g. integrated GPS, colour display, encryption and authentication) at a very accessible price (< 1,000 USD)
  - P25 handsets with equivalent characteristics seems to be in the 3,000 to 5,000 USD range
- Systems
  - Comparison is less straightforward due to variation in scope of contracts
  - Common to find announced P25 contracts with a total system price of approximately 1,000,000 USD per radio site
  - The corresponding costs in the announced TETRA contracts are typically several times lower



[This does not reflect that TETRA is blocked in the US (and Canada). Also does not reflect that TETRA far outsells P25 internationally.]

Numbers of TETRA contracts per region and country around the world: see -- <http://www.tetramou.com/tetramou.aspx?id=2413>

|                 | GSM                                                                                 | GPRS                                                                   | EDGE       | UMTS |
|-----------------|-------------------------------------------------------------------------------------|------------------------------------------------------------------------|------------|------|
| Services        | Voice - data                                                                        | Internet WAP - Image & File Transfer                                   | Videoconf. |      |
| Bit Rate (Kbps) | 9,6                                                                                 | 10-70                                                                  | 20-200     | 384  |
|                 | Voice - Data<br>2,4 - 28,8                                                          | Data - Image Transfer - Videostreaming<br>up to 538 kbps PD Throughput |            |      |
|                 |  | <b>TETRA2 – TEDS</b><br>(TETRA Enhanced Data Service)                  |            |      |



Above: Estimation by VDC of market size for mission-critical radio equipment sales, using a limited definition: mostly public agencies. The *entire private / professional radio market* is a large multiple of this size considering all segments, and considering that this market is moving toward larger, multi-entity, multi-VPN networks including multi-agency and public-private networks.



#### Why GAO Did This Study

As the first to respond to natural disasters, domestic terrorism, and other emergencies, public safety agencies rely on timely communications across multiple disciplines and jurisdictions. It is vital to the safety and effectiveness of first responders that their electronic communications systems enable them to communicate with whomever they need to, when they need to, and when they are authorized to do so. GAO was asked to determine, among other things, (1) the extent to which Department of Homeland Security (DHS) funding and technical assistance has helped to improve interoperable communications in selected states and (2) the progress that has been made in the development and implementation of interoperable communications standards. To address these objectives, GAO reviewed grant information, documentation of selected states' and localities' interoperability projects, and standards documents.

#### What GAO Recommends

GAO is making recommendations to DHS, which include assessing how states' grant requests support statewide communications plans and modifying its guidance on acquiring interoperable equipment. DHS disagreed with the latter recommendation, but GAO believes that it is important to provide more flexibility until completed subsets of standards have been fully defined. DHS agreed or deferred comment on all others.

[www.gao.gov/cgi-bin/gettext?GAO-07-301](http://www.gao.gov/cgi-bin/gettext?GAO-07-301).

To view the full product, including the scope and methodology, click on the link above. For more information, contact Linda Koontz at (202) 512-6240 or [koontz2@gao.gov](mailto:koontz2@gao.gov).

April 2007

## FIRST RESPONDERS

### Much Work Remains to Improve Communications Interoperability

#### What GAO Found

According to DHS, \$2.15 billion in grant funding was awarded to states and localities from 2003 through 2006 for communications interoperability enhancements. This funding, along with technical assistance, has helped to make improvements on a variety of specific interoperability projects. However, states that GAO reviewed (see table below) had generally not used strategic plans to guide investments toward broadly improving interoperability. Further, no national plan was in place to coordinate investments across states. To its credit, DHS has required states to implement a statewide plan by the end of 2007, and DHS has recently been required to implement a National Emergency Communications Plan. However, no process has been established for ensuring that states' grant requests are consistent with their statewide plans. Until DHS takes a more strategic approach to improving interoperable communications—such as including in its decision making an assessment of how grant requests align with statewide communications plans—progress by states and localities in improving interoperability is likely to be impeded.

Until recently, the private-sector coordinating body responsible for developing Project 25 standards—a suite of national standards intended to enable interoperability among the communications products of different vendors—has made little progress. Although one of the eight major subsets of standards was defined in the project's first 4 years (from 1989 to 1993), from 1993 through 2006, no additional standards were completed that could be used to develop Project 25 products. Specifications for three additional subsets of standards were defined over the past 2 years. However, ambiguities in the published standards have led to incompatibilities among products made by different vendors, and no compliance testing has been conducted to determine if these products are interoperable. Nevertheless, DHS has strongly encouraged state and local agencies to use grant funding to purchase Project 25 radios, which are substantially more expensive than non-Project 25 radios. As a result, states and local agencies have purchased fewer, more expensive radios that still may not be interoperable and thus may provide few added benefits. Until DHS modifies its grant guidance to provide more flexibility in purchasing communications equipment, states and localities are likely to continue to purchase expensive equipment that provides them with minimal additional benefits.

#### DHS Grant Funding to Improve Interoperability in Selected States

| State    | Grants from 2003 through 2006 |
|----------|-------------------------------|
| New York | \$145.5 million               |
| Kentucky | \$50 million                  |
| Oregon   | \$53.4 million                |
| Florida  | \$55.7 million                |

Source: GAO analysis of DHS data.

- **Complete Project 25 systems can be prohibitively expensive.** Project 25 radios are significantly more expensive than conventional analog radios, and while state and local agencies are paying two to three times more for Project 25 radios, they are not always able to take advantage of the intended interoperability benefits because they cannot afford to procure complete systems. Project 25 radios for first responders can range in price from about \$1,000 to about \$5,000. Most Project 25 radios used by first responders cost around \$2,500. According to officials, a conventional analog radio suitable for first responder work generally costs about two to three times less than Project 25 radios. Benefits of using Project 25 radios, such as interoperability among multiple vendors' equipment, cannot be fully realized until a complete Project 25 system (base stations, repeaters, and radios) is implemented. Fully replacing an existing radio system with a Project 25 system is very expensive. For example, Arlington County, Virginia—a relatively small county—is acquiring and implementing a full Project 25 environment for \$16.8 million. Many localities do not have the funding to make such a large investment.

While states and localities have purchased Project 25 radios at the direction of DHS, there is little indication that these radios have enhanced interoperability. Most jurisdictions we visited were not using the Project 25 capabilities, such as interoperating with different vendors' radios, since they had not fully replaced their existing radio communications infrastructure with a complete Project 25 system. Specifically, of the 11 localities we visited, 8 were buying Project 25 radios and, of these, 7 were not using the Project 25 capabilities of the radios. Thus, as a result of the DHS requirement to buy Project 25 equipment, agencies have purchased fewer, more expensive radios with little or no additional benefit to date.